THE FARM INDEX

U. S. Department of Agriculture February 1976

Two Centuries of Clever Contraptions

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Outlook

Sluggish economic recovery abroad could dampen prospects for another record high for agricultural exports. Analysts already figure the total value of 1975/76 exports will nose down somewhat from the $22.7 billion estimated last November. However, dollar value should be near the $21.6-billion chalked up in 1974/75.

Meanwhile lower prices for last fall's bumper crop mean export volumes should be up substantially from last year.

One factor, economists say, is the weak showing of consumer demand for nonessential items in Western Europe, which takes about $7 billion, or one-third, of our agricultural exports. Our products are moving to Europe more in response to poor harvests there than to strong consumer buying. Farm exports to Japan, another big customer, may show little or no value change in 1975/76.

For the rest of the marketing year, the economic health and recovery prospects for many of our foreign markets could have a strong bearing on farm export totals.

Real gross national product fell in virtually all major industrial countries last year. Japan alone eked out a marginally positive growth rate. And despite a brighter outlook for the U.S., Canada, and Japan in 1976, at this time other industrial nations appear to be lagging behind.

However, the expected economic growth should boost import volume and trade between industrial countries this year, although full effects of the economic upswing won't be passed on through the trade sector. Also, growth in OPEC imports from developed nations will probably shrink considerably from the nearly 50-percent surge of 1975.

Inflation appears to be ebbing in most developed countries, and 1976 should usher in generally lower rates. Italy and the United Kingdom, however, still suffer extremely high rates of inflation.

Developing countries—which sell 75 percent of their exports to developed nations—felt the repercussions of recession last year, and the outlook for the poorest of these countries is still gloomy. Non-oil exports to developed nations fell in 1975 while financial constraints curbed needed imports.

Soviet Science Tackles the Weather

What are the Soviets doing to cope with harsh weather? The question was asked by a team of U.S. agriculturalists who visited the U.S.S.R. last fall under the U.S.-U.S.S.R. Agreement on Cooperation in the Field of Agriculture.

The Soviet Union, the team learned, is placing considerable emphasis on the study of agro-meteorology—the impact of weather on agricultural production. This is mainly because the climate of their major agricultural areas is more severe than in the U.S., being generally cooler and drier.

Most Soviet agriculture occurs between 42° and 55° north latitude. This compares roughly with the area from the Central Corn Belt to the northern fringes of the Canadian spring wheat lands on the North American continent.

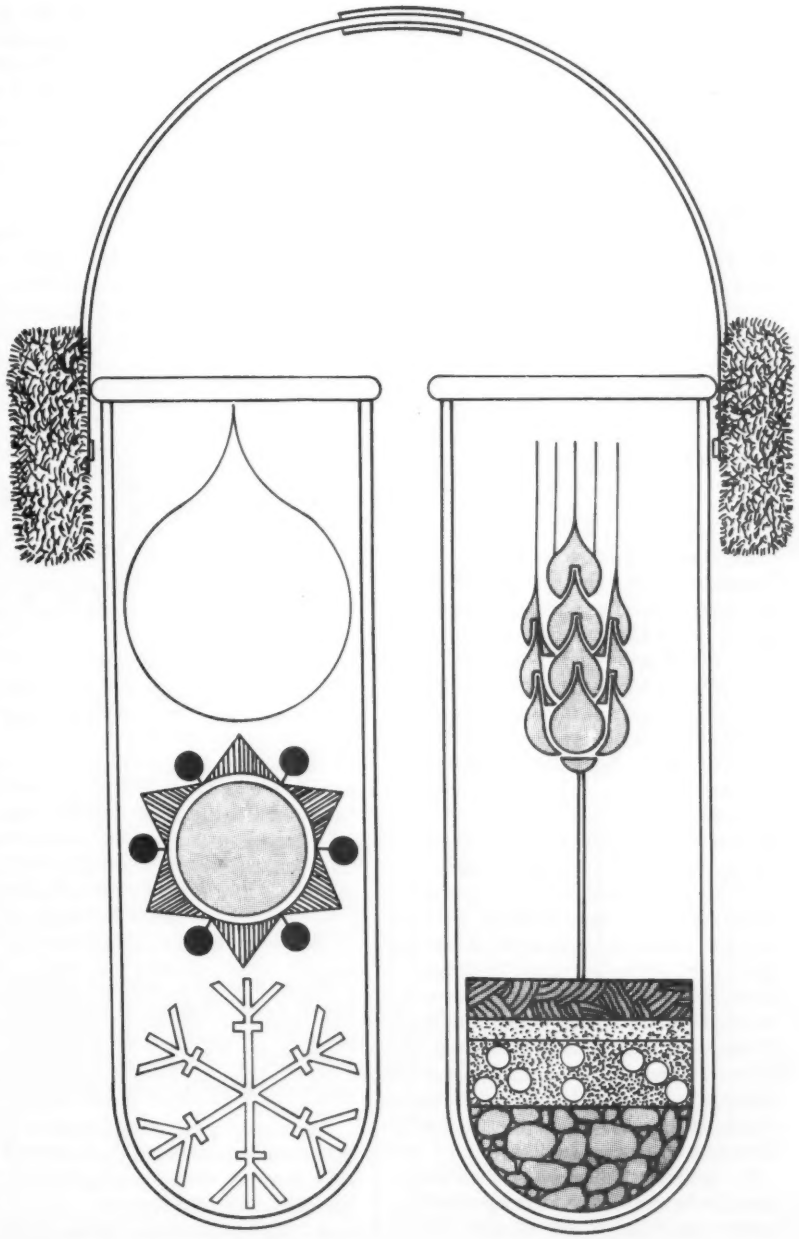
The Soviets have four primary programs in agro-meteorology, each dealing with a different aspect or scale of the weather. These include:

• **Investigation of the atmosphere.** Much like our own National Weather Service, National Oceanic and Atmospheric Association (NOAA), the Hydrometeorological Service of the U.S.S.R. prepares routine forecasts for 1, 3, 5, 10, and 30-day periods. Information on severe weather conditions—such as wind, hail, snow, visibility, and rainfall—is sent to various government agencies, but its dissemination is not as broad as in the U.S. (newspapers, radio, and television).

In addition, the Soviet's Hydromet Service conducts atmospheric research to improve and extend forecast capabilities.

According to the National Weather Service expert who accompanied the U.S. team to the Soviet Union, Russian efforts in this area are similar to ours.

•**Agro-meteorological investigations.** In order to better understand the impact of weather on agricultural production, detailed research is also needed on a smaller scale. For example, how do different plants and animals respond to changes in weather? Soviet efforts are comparable to the work done by



USDA's Agricultural Research Service and land grant colleges.

Examples of research conducted under this program include the relationship between soil moisture and plant height, the impact of temperature and moisture on winterkill, the loss of topsoil by strong winds, the relationship of soil moisture and fertilizer utilization, and time of bloom of fruit trees.

Various moisture conservation experiments have been carried out under the investigations program. One involves the use of "minimum tillage," which has been developed extensively in the New Lands area of Kazakhstan.

This method involves the use of a V-shaped blade to sweep below the soil surface, killing weeds and loosening the soil, but maintaining the stubble cover. This reduces the amount of moisture lost by evaporation, and the stubble helps to catch snow and increase moisture penetration, as well as keep soil erosion to a minimum.

During the fallow year, the V-blade is used 5 times, each time working at a deeper depth. The final sweep is almost 16 inches deep.

Typically, the top 3 feet of New Lands soil will hold up to 8 inches of moisture. In the spring following fallow there is normally 2-3 inches more moisture available than in the remaining years of the rotation. Use of the minimum tillage method has resulted in greater soil moisture than in fields which have been plowed by moldboard plows.

Another means of increasing soil moisture is through the use of natural snow fences. Parallel rows of sunflowers or mustard are planted every 40 feet across the fields, which trap the snow and prevent it from being blown away by wind. Ridging—plowing snow into spaced ridges—is another means of promoting more uniform snow retention. According to Soviet scientists, these methods can result in an extra 3-4 inches of soil moisture each year, adding 4-5 bushels per acre to yields.

In general, this Soviet weather program is very intense and probably more advanced than in the U.S., mainly because the climatic problems faced by the Soviets are so numerous.

•Agro-meteorological services. Probably the least developed of the Soviet agricultural weather programs, these provide daily advisories to farm managers on local weather conditions and how they will affect crops, as well as how the weather may affect the decisions the farm manager must make.

Information in the advisories is related to current crop activities—for example, time of the expected bloom of fruit trees, soil temperature for seeding, suggested fertilizer applications based on soil moisture conditions, danger of frost or pest problems, and so on.

This effort is similar to the Agricultural Weather Service program of the National Weather Service, which sends daily advisories to about 19 States over NOAA "Weather Wires" and makes the information available to local radio and TV stations.

The U.S. program appears to be well ahead of the Soviets' in this area, both in terms of the amount of information provided and the means for getting it out.

• Yield forecasting. Because of their vast agricultural areas and the variety of weather that occurs in a "normal" year, the Soviets have developed a multilevel system for using routine meteorological information to follow potential production throughout the season, including a network of 6,000 soil moisture sampling sites.

Meteorological information is summarized every 10 days, from which yield forecasts are made at the republic and regional levels. The information is also summarized in a report similar to USDA and NOAA's Weekly Weather and Crop Bulletin. It contains material on the latest weather conditions, the state of crops, and an estimated yield figure for each oblast.

[Based on special material from Richard Felch, Agricultural Weather Service, National Weather Service, NOAA.]

U.S.S.R.'s Top Food Producers

The most important food producing areas of the Soviet Union are the republics of the Ukraine and Kazakhstan.

The Ukraine, which has been called the breadbasket of the Soviet Union, produces a wide variety of crops. These include 25 percent of all Soviet grain, 60 percent of the sugarbeets, and nearly 50 percent of the sunflowers, an important oil crop.

There are three general climatic zones in the Ukraine. The southern "prairie" receives 14-16 inches of precipitation annually and is an important grain-producing region.

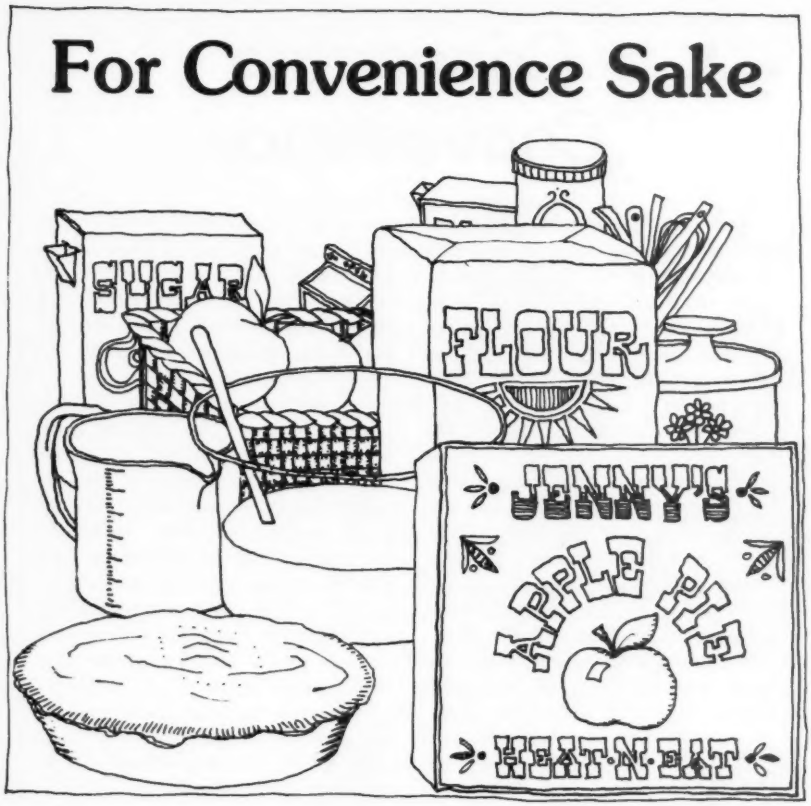
The middle prairie steppe gets 16-20 inches of moisture and produces a mixture of grain, sugarbeets, potatoes, and other crops.

The northern region receives a generous 24 inches or more of rain each year, but cool temperatures restrict production to such crops as flax and potatoes.

Kazakhstan is the U.S.S.R.'s major spring wheat region. Most of the wheat is grown in its "New Lands" area, located in the northern third of the republic.

The New Lands normally have a dry spring, with good precipitation in the summer. Soviet farmers are forced to hold off planting until May 25, so that the young crop won't dry up before the summer rains. Frost is a danger by late August, causing the New Lands to have a very short growing season. If the summer rains don't come, the situation is serious. Witness 1975, when grain production was a third less than planned.

For Convenience Sake



The homemade way may not always be the cheaper way, a survey of convenience foods shows. Out of more than 160 convenience foods studied, about a third cost less than the similar dishes made from scratch.

But wait before you run out and stock the fridge or pantry. Although some convenience foods are somewhat cheaper than home-prepared, others are far more expensive. So if lower food costs are your goal, watch what you're buying.

The study covers July 1974 to June 1975, and is based solely on food ingredient costs. No comparisons or allowances are made for nutritive value or culinary skills, equipment, and time involved in food preparation—factors the consumer might want to consider.

Convenience defined. The study defined convenience foods as "any fully or partially prepared foods in which significant preparation time, culinary skills, or energy inputs have been transferred from the homemaker's kitchen to the food processor and distributor." Therefore, convenience foods included everything from canned and frozen single-ingredient fruits and vegetables, to meat entrees, with built-in chef service.

Prices of some fresh vegetables present a good argument for using the processed kinds. Canned or frozen green peas in particular offer a big saving. A fresh dish of peas would cost you about 27 cents during the survey period, where canned or frozen were about 11 cents.

Processed lima beans and spinach are other big economizers. Frozen limas were the cheapest at 11 cents a serving, with canned 14 cents, and fresh almost 29 cents. Frozen spinach was the best buy at almost 11 cents a serving, followed by canned at 13, and fresh at nearly 25.

Seasonal influences. Asparagus spears, brussels sprouts, and corn are a bit less expensive in the frozen or canned form. However, fresh is a better buy during the growing season.

On the other hand, butter beans are much cheaper to cook from the dried bean (4 cents a serving, according to the survey) than to buy in the can (11 cents a serving). Vegetables with built-in chef service, like broccoli spears in Hollandaise or butter sauce or scalloped, stuffed, or au gratin potatoes are considerably cheaper from scratch, too. However, lest you despair at the thought of peeling all those spuds in an economy move, you can always serve frozen french fries or potato puffs since these actually cost less than their homemade counterparts.

Squeezing is costly. Fruit is another major food group where for some items the fresh form may be more expensive than the processed. Orange juice is the most striking example. Squeezing it yourself costs almost 12 cents a 4-oz. glass, the survey shows, where making it from frozen concentrate ran only slightly more than 4 cents. Canned orange juice averaged about 6½ cents a glass. Lemon juice, too, is cheaper in the ready-squeezed form.

If you're buying tart red pitted cherries, it's almost a tossup between fresh and canned. The cost scale tips both ways for cranberry sauce: Strained sauce is cheaper in the can, but the kind with whole berries costs less to make yourself. Bear in mind, though, that sugar prices during the survey period were unseasonably high, so the homemade strained sauce was at a disadvantage.

Strawberries are the cheapest when bought fresh. However, when not in season, frozen berries in a bulk bag are the best buy. Fresh peaches are also the best bargain, followed by canned. Frozen peaches are considerably more expensive.

Grandma's goodies. Stirring up your own breakfast goodies and desserts may be costing you more than you think. For example, Grandma's baking powder biscuits are still more economical than ready-to-bake kinds or mixes, but not so for steaming hotcakes or waffles. In fact, hotcakes or waffles made from a complete mix cost only about two-thirds as much as the homemade ones.

Watch out for the frozen varieties if you're pinching pennies, though, because they are about 3 times as expensive as the homemade variety.

Frosting and pudding mixes can also save you money. Chocolate pudding made from scratch cost almost 12 cents a serving in the survey period, compared with 10 cents a serving with a mix. The snack-size canned type was the most expensive.

That American favorite—apple pie—is still made most economically in your kitchen. A homemade slice cost about 12½ cents; one from a piecrust mix and canned apple pie filling, nearly 18; frozen, 20½; and ready-baked, 24. The other pies included in the survey, cherry and coconut cream, were also cheaper when prepared at home.

Main-dish pitfalls. If these cost comparisons tantalize you to retire the mixing bowl and measuring cups, hold off: Main-dish convenience foods are often more expensive, sometimes a lot more. For example, a frozen beef dinner that cost 79 cents in 1974-75 would have cost 51 cents if made at home. And a 71-cent frozen turkey dinner would have cost only 29½ cents to make. Sweet-and-sour pork, whether packaged or frozen, carries a premium price too.

There are some bargains to be found though. Chicken chow mein is most expensive when bought frozen, but you come out ahead with the canned version. Also, if you like to extend your meat by adding soy protein, it's cheaper to buy the ground beef mixed with soy at the grocery store. Reason is that grocery stores get a break in price on soy protein because they buy in bulk.

Mixes offer break. Skillet main-dish mixes can sometimes offer a price break too. The ERS survey found that lasagna mix was over 9 cents a serving less than the homemade version, and the tuna noodle casserole mix, 3 cents cheaper. Packaged stroganoff ran only slightly higher than homemade—1½ cents a serving. Chili-macaroni mix, however, got a bit more expensive—2½ cents over the homemade.

Canned spaghetti or a package mix came out cheaper than homemade by over 6 cents, probably because the convenience versions use less expensive cheeses than the parmesan generally added to home concoctions.

If you plan on baking a pizza at home and you're watching the budget, either make one from scratch or else use a mix. At least for a cheese pizza, these are essentially the same price. However, a frozen one cost a hefty 24 cents more per wedge, the ERS study showed.

Seafood bargains. Seafood may also offer some convenience food bargains. A serving of crabcakes averaged 8 cents cheaper than freshly prepared ones. Frozen or canned shrimp was about 11 cents less than fresh. Of course if you live near the coast, your chances of getting reasonably priced fresh seafood may be pretty good.

As with most convenience food items, the plainer seafoods offer more of a price break than the complete dinners or the gourmet dishes. For example, the survey team reported that a frozen haddock dinner was almost 45 cents more expensive than a home-prepared one. Shrimp newburg cost only 69 cents a portion if you made your own, but $1.13 if you bought it frozen.

Dairy comparisons. Most Americans don't prepare their own dairy products these days, other than some cottage cheese and home-churned butter when milk is supplied by the family cow. Still, the consumer can bargain shop at the supermarket.

For instance, American cheese costs essentially the same whether in a loaf or slices, but cheese food in an aerosol can is 3 times as expensive as cheese food in a loaf. Margarine in a tub or a squeeze bottle is higher priced than stick margarine—all of which carry a smaller price tag than butter.

[Based on speech, "Convenience Foods—1975 Cost Update: A Preliminary Report," by Larry G. Traub, National Economic Analysis Division, and Dianne Odland, Agricultural Research Service, at the National Agricultural Outlook Conference, Nov. 20, 1975, Washington, D.C.]

Converting Convenience

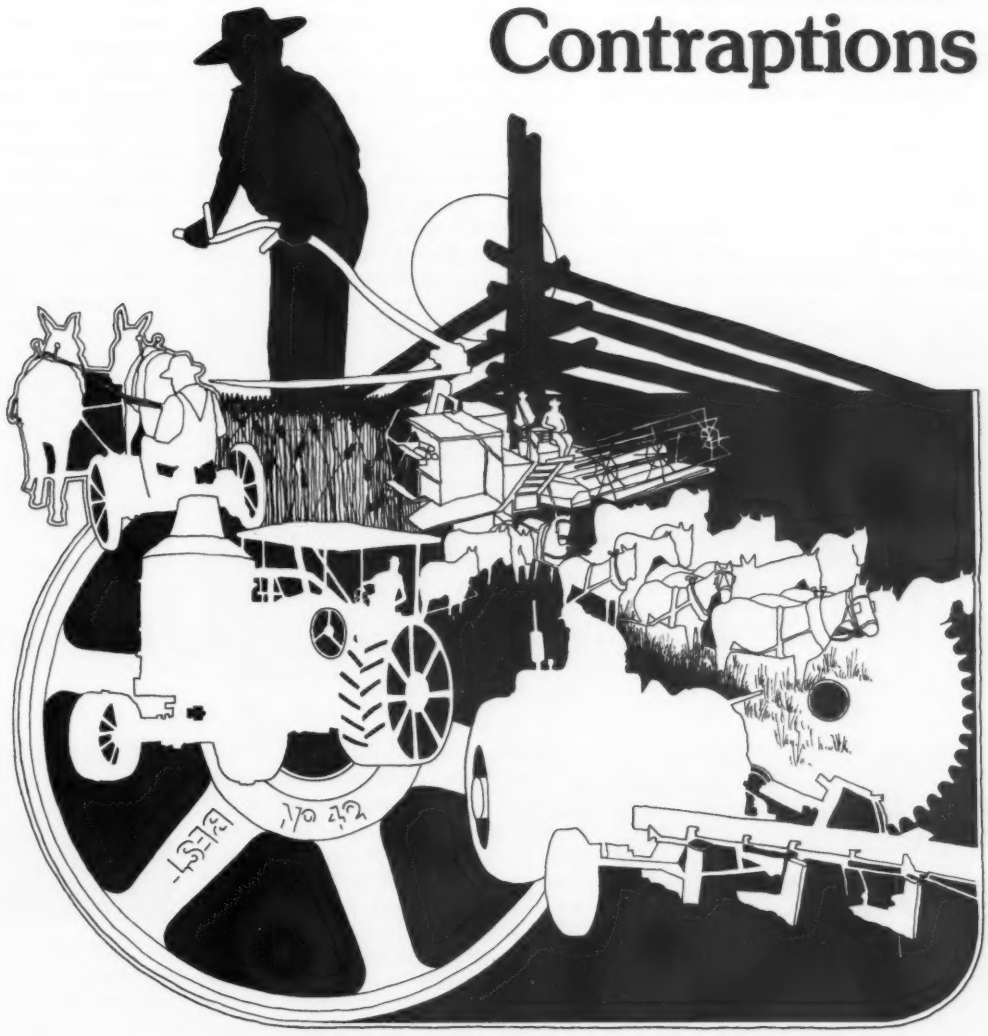
Here's how the ERS study came up with all the cost comparisons. ERS first collected price data from leading retail chain stores in Philadelphia, Milwaukee, Oakland, and New Orleans, then computed cost per ounce and converted it to cost per serving.

Wherever possible, recipes for home-prepared items were adjusted to fit ingredients in corresponding convenience foods. For example, if a convenience food contained butter instead of margarine, butter was used in the home-prepared version. However, no attempt was made to make exact adjustments.

The cost of each ingredient used in the home-prepared foods was based on the original amount of food required to yield the final amount needed. To illustrate, the cost of chicken in a recipe calling for 2 cups of cooked, diced chicken was based on the cost of the raw chicken needed to produce that much meat. Costs for vegetables that had to be trimmed or pared or canned ingredients that had to be drained were also figured on the whole item.

An interesting sidelight of the study: Six of the convenience products dropped in price by at least 1 cent per serving during the 12-month study period, despite rising food production and marketing costs. In order of decreasing savings, they were: shrimp newburg frozen in a pouch, frozen beef dinner, frozen partly prepared fried shrimp, canned chicken meat, frozen peaches, and frozen partially cooked fried shrimp. Outside the seasonal fluctuations in prices of some fruits and vegetables, none of the home-prepared foods decreased in price.

Two Centuries of Clever Contraptions



Swishing their hand-held scythes in steady arcs, Colonial American farmworkers harvested wheat with a technology as old as ancient Egypt.

Today, only two centuries later, a one-man grain combine rumbles through the fields, effortlessly performing the work that would have required dozens of colonial farmers.

This great technological upheaval not only thrust American agriculture from the level of bare self-sufficiency to that of supplying much of the world, it also meant that side effects would greatly affect American society.

Man would become obsolete in many farming operations, and the resulting tide of migration to cities would spawn social problems that still elude solution. The changes occurred so rapidly that no orderly transition from rural to urban society could be instituted. Yet, without these advances, mankind would face an even greater hunger problem.

Story of mechanization. The story of mechanization of American agriculture and its impact on American history may have begun in the same fertile minds that hatched the concepts that led to the American Revolution, guided the course of the

rebellion, and molded the system of American government.

Indeed, Thomas Jefferson and George Washington were perhaps as interested in agriculture as they were in founding a new Nation.

In that age of profound social thought, the seeds of a new agricultural technology were planted and nurtured.

Washington constantly searched for better farm implements for his beautiful Mount Vernon plantation by corresponding with progressive British agriculturalists.

Jefferson, who was an amateur inventor, tinkered with many devices designed to improve farming.

Common concerns. Although Jefferson's designs were rarely practical, the concerns that he and Washington shared in improving agriculture mirrored the concerns of the land where 9 out of 10 workers were engaged in agriculture.

Those Virginia aristocrats may have shared common concerns with typical farmers in 1776, but certainly not lifestyles. The life of the typical farmer was less attractive than that of the Virginia aristocrats. To earn his livelihood, the colonial farmer cleared virgin land with axes and oxen, broke soil with ox-drawn wooden plows, planted seed by hand, and harvested and processed the crop with the crudest, hand-held implements. The aristocrats simply had their hired hands and slaves do that kind of work.

Red Coats and tommyhawks. Although colonial farm life has been much romanticized as being simple and untroubled by such modern problems as crime, poverty and foreign threats, it was far from being utopian. A more severe form of "mugging" came with Indian raids, "foreign threats" roamed the countryside in red British uniforms, and poverty, which in those days meant starvation rather than low income, was the inevitable consequence of a crop failure. In short, farm life was extremely hard, dangerous, and uncertain.

The first great American agricultural invention arrived in 1793 in the Nation's infancy: Eli Whitney's cotton gin.

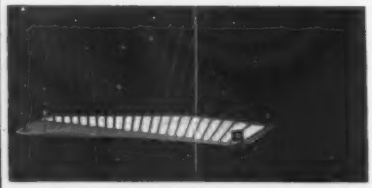
The cotton gin, which separated lint from seed, not only made possible a great new farm staple in the South, but it revitalized the dying institution of slavery and led to the Civil War.

Cotton boom. Cotton production jumped from 10,500 bales in 1793 to 4.5 million bales in 1861. The effect on the American economy was far-reaching. New England was encouraged to develop textile mills, which gave incentive for development of still other new tools and methods.

While cotton production proliferated with the new technology, grain production was held back by many problems that awaited a series of inventions to resolve.

The plow was the object of attention for many inventors. The first patented plow was designed by Charles Newbold. The Newbold plow was solid cast iron, except for handles and beam.

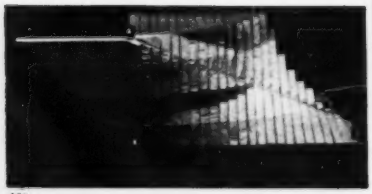
Thomas Jefferson's Plow Design



(1)

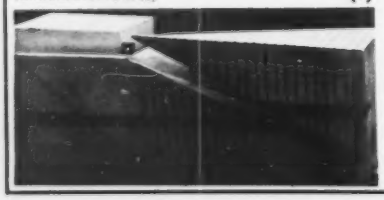
Thomas Jefferson's plow design incorporates: (1) the concept of two wedges to raise and turn the furrow. Line A-C is wedge intersection, and parallels A-E to D-C show positions at a given time. (2) The concept is transferred to a block of wood. (3) The block is sawed along traverse lines A-C and D-E to form the moldboard. (4) The finished product as was presented to the American Philosophical Society in 1798.

Jefferson began work on this design in 1788 by applying mathematical principles to produce a more efficient plow that could be uniformly manufactured.



(3)

(Smithsonian Photo) (2)



(4) *(Smithsonian Photo)*

Few farmers were willing to try the new implement, however, because many were convinced that iron poisoned the land and made weeds grow.

The Wood plow. In 1814, Jethro Wood patented another cast iron plow and improved it in 1819. Moldboard, share, and landside were cast in three interchangeable parts, allowing damaged parts to be replaced. The Wood plow was popular.

As farmers pushed westward onto the prairies, another problem confronted the plow. Prairie soil stuck to both wooden and cast iron plows instead of sliding by and turning over.

In 1833, Illinois blacksmith John Lane came up with the idea of fastening strips of saw steel over wooden moldboards. Another Illinois blacksmith, John Deere, used saw steel and smooth wrought iron for shares and moldboards. By 1846, Deere and his partner were turning out 1,000 plows a year.

Horse-drawn reapers. The harvesting problem also received attention. Obed Hussey patented a horse-drawn reaper in 1833. At about the same time, Cyrus H. McCormick completed a design his father had started and patented his reaper in 1834. By 1851, 1,000 McCormick reapers were produced each year to dominate the business.

The corn cultivator preceded the reaper, and it was in limited use by the 1820's, along with the revolving rake. In 1837, the Pitts brothers patented a widely used threshing machine. W.F. Ketchum patented a mower in 1844 and 1847.

By the time of the Civil War, the array of horse-drawn equipment included grain drills, corn shellers, haybaling presses, cultivators of various types, and many other farm implements. Farmers were deluged with magazine advertisements that extolled the real—and imagined—virtues of newfangled machines.

Farmers not inclined. Yet, most farmers were reluctant to invest in the expensive new equipment when labor was so plentiful and cheap, and food prices were relatively low. The equipment was available, but the inclination to try it was not.

Then, in 1861, South Carolina troops opened fire on the Federal installation at Fort Sumter. The huge supply of farm labor suddenly disappeared as thousands of farm hands joined Union and Confederate armies. With a huge demand for food to supply the great armies, food prices shot up.

The thunder of cannon had ushered in the day of horse labor, and marked the end of the day of hand labor. With these new incentives, farmers quickly adopted horse-drawn machines.

Sad homecoming. As the war ended, Union soldiers found that their farm jobs had been displaced by horse-drawn contraptions, and Confederate soldiers returned to the ruins of the one-crop agricultural system. And although thousands of black Americans found themselves free of the bondage of slavery, they were also faced with great economic uncertainty that was eventually "solved" by the sharecropper system.

Something else evolved from the war that was, perhaps, just as significant: the day when a farm laborer could start his own operation by acquiring cheap land and a few hand tools was gone forever.

The dream of owning a farm was restricted by the expense of the machines required to be competitive.

The surplus problem. Even those who were able to buy the machines found themselves in deep trouble. The virtue of the machines—increased production—resulted in surpluses that depressed prices. Farmers, then, became more dependent on bankers and merchants.

In 1850, each farmer had an average of $7 invested in equipment. By 1880 that amount had almost quadrupled. The war had forced farmers to become committed to commercial production and to rely on necessary machines.

As a result of these investments, farmers faced a constant battle between 1870 and 1900 to produce enough to pay for their machinery.

(Smithsonian Photo)

Breaking Raw Prairie

Plagued by surpluses and low prices, farmers were advised to cut production, but no individual farmer could influence the market. Cooperatives helped, and as this first agricultural revolution ran its course, supply and demand came into close balance between the Spanish-American War and World War I.

Machines improve life. Despite the problems, mechanization was still considered beneficial. In 1898, a USDA spokesman wrote: "Mechanical contrivances have largely supplanted human labor in

many respects, or have improved the application of labor and increased the product of agriculture, reduced the cost of production, augmented the farmer's gross income, and made his life an easier one than it was before the machine period."

Before the advent of machines, farming was often a spirit-breaking occupation. With machines, the able farmer could attain prosperity and leisure, and educate his children.

Not all farmers prospered, however. The expense of machinery and other factors forced many farmowners to sell out and become tenants and hired workers.

Tide of migration. Along with this trend, the number of available farm jobs dropped as machines replaced laborers. A tide of farm people began migrating to the cities where jobs were not available. This spawned urban slums and the resulting social problems of crime and poverty.

In the early years of the 20th century, most attention was still focused on developing machines to increase production. The soil was a neglected resource, as the general practice was to abandon land when it was depleted. With vast undeveloped areas, few people worried about soil enrichment. Yields per acre rarely increased from year to year.

Twilight of the horse. Meanwhile, the day of the horse was approaching its twilight as the minds of men turned to steam and petroleum power. Steam engines were used to thresh wheat on large Western farms. By 1913, 10,000 such devices were produced. After that, their use declined rapidly as gasoline tractors came on the market.

The first practical, self-propelled gasoline tractor was built in 1892 by John Froelich of Iowa, who mounted a gasoline engine on a running gear equipped with traction equipment. The Froelich was the forerunner of the John Deere tractors.

In 1905, C.W. Hart and C.H. Parr founded a business devoted exclusively to making tractors, in Iowa City.

Wars help machines. Still, it took something else to convert these contraptions from novelty into general acceptance. Both the adoption of gas-powered equipment and the adoption of the horse as a labor source share a common instigator: the outbreak of war. In both instances, wartime labor shortages forced farmers to turn to labor-saving technology.

In World War I, farm prices climbed and labor shortages developed as in the Civil War. Once again, farmers quickly adopted the best labor-saving, productive equipment that was available. Tractor sales accelerated rapidly.

But in July 1920 farm prices nosedived, and during the 1920's the farm economy looked so uncertain that farmers were reluctant to switch much further toward expensive tractor power. Even so, the number of horses declined and the number of tractors increased.

Gasoline-powered combine. Another major innovation came into wide use in the twenties: the gasoline-powered combine. Horse-drawn combines had been used as early as in 1836, and steam-powered combines were manufactured in the 1880's. By

This 1851 farm scene, painted by Currier, depicts the grueling labor shared by man and oxen in guiding a plow along a straight furrow. As evidenced by the child, farming was a family chore.

(Smithsonian Photo)

1912, gasoline had begun to replace steam as a combine power source.

In 1935, a one-man combine was developed, powered by a two-plow tractor. The impact on the farm job market was devastating, since the one-man combine performed the work of a dozen men.

The switch from horsepower to self-propelled machines was accelerated by World War I. But many farmers resisted the change until World War II, when an even greater demand for food and men and rising market prices, caused them to reconsider.

Second agricultural revolution. Just prior to the war, more groundwork for the switch had been laid through New Deal programs that encouraged farmers to replace wornout machines with current models. The rural electrification program had opened a vast new power source. The stage was well set for the "second American agricultural revolution."

The switch to mechanization was only part of that revolution, however. Great advances were made in seed development, soil conservation, irrigation, fertilizers, and pesticides. In effect, the systems approach to farming had arrived, and the results were awesome:

- Wheat production soared from 313 million bushels in 1875 to 668 million bushels in 1925 and 2.2 billion bushels in 1975.
- Since 1950, wheat yields per acre have doubled, corn yields more than doubled, cotton yields almost doubled, and soybean yields increased significantly.

Yet, there is a darker side to this story. What happens to the millions of Americans who are no longer needed on the farm?

Just taking the years between 1950 and 1975, farm employment was reduced by 66 percent, or 5.6 million. It's expected to drop another 10 percent by 1980.

The impact on many rural areas was catastrophic, with small town businesses, schools, and even churches receiving crippling effects as economies suffered and people faced unemployment or migration.

Displaced farmworkers. In the early 1960's, a steady flood of migrants poured into cities, aggravating already severe economic and social problems. Other displaced workers remained in the rural areas, living in deep poverty.

An upbeat note has been sounded in recent years, however, as signs increasingly point to a turnaround of rural economics and a steady decline of migration to the cities.

Granted, grave social problems have accompanied farm mechanization. But, consider the alternatives.

Without the highly mechanized American agricultural system, world hunger would be much more severe. And, without the cornerstone of agricultural exports, the balance of trade would tilt dangerously against the U.S., with rising foreign oil costs and the sinking of the value of the dollar causing inflation to reach even higher levels.

[Based on the manuscript, "The Mechanization of American Agriculture," by Wayne D. Rasmussen, National Economic Analysis Division.]

(Smithsonian Photo)

The age of mechanized farming dawned at the turn of the century with such contraptions as this Hart-Parr gasoline traction engine.

FROM MUSCLE TO M

(Smithsonian Photo)

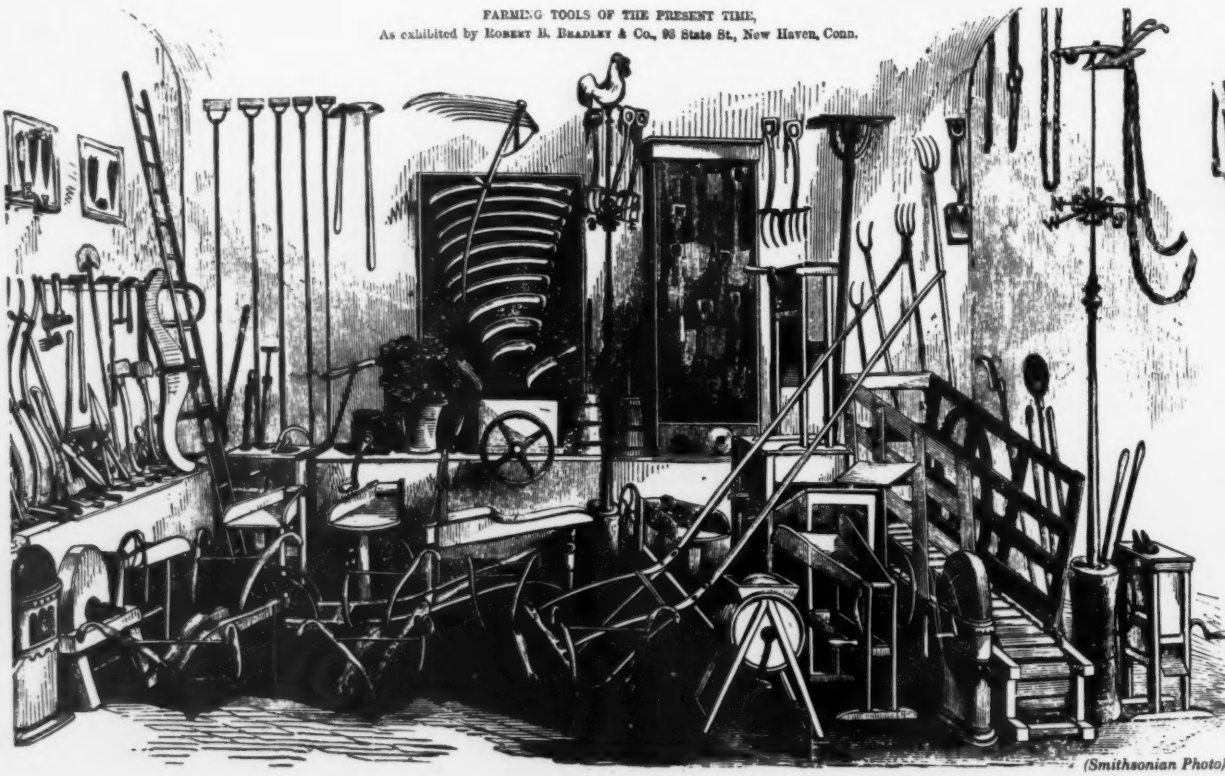
(Smithsonian Photo)

Armed with the crude tools of age-o European agriculture, the America farmer battled the rugged land wi sweat, muscle, and courage during th early years.

His hands were calloused and stron from the grueling, day-to-day labor. Fa ming was an occupation for the you and the strong, and for men and wome with the will to endure hardships.

Perhaps incredibly, these are the too that tamed the wilderness.

In the early 19th century, farmers fought the land with such tools as the horse-drawn cultivator (above), the Cary plow (right), and a wide assortment of hand tools (below). The hardships of farm life are evident in the nature of the tools.



FARMING TOOLS OF THE PRESENT TIME,
As exhibited by Robert B. Bradley & Co., 93 State St., New Haven, Conn.

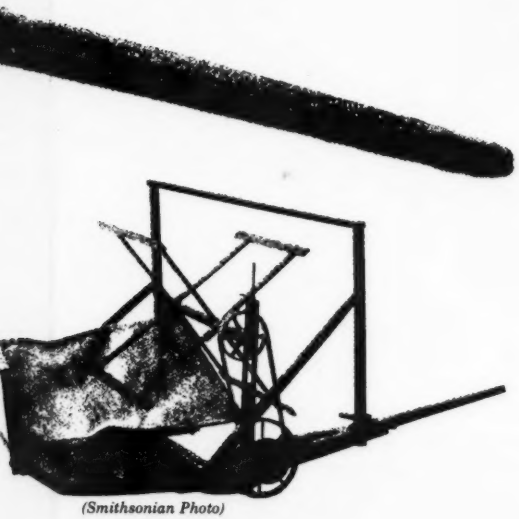
(Smithsonian Photo)

IACHINERY

Then, minds sought relief for weary bodies by conceiving an array of machines.

The first machines were simple labor-saving devices, generally powered by horses, mules, and oxen. As needs became evident, minds set about meeting those needs. When prairie soil stuck to plows, new plows were quickly designed.

As years passed, machines became more complicated and more efficient until men sat atop machines while horses watched in wonder.



(Smithsonian Photo)

E. WHITMAN & CO'S

Premium Iron Cylinder Thresher.

☞ The teeth are set in spiral form or in straight lines, as may be desired by the purchaser. There is no diffence in price.

E. WHITMAN & CO. manufacture and sell the only THRESHING DRUM in the world which will neither wear out nor break by use. After using one of these Drums one hundred years, it will be as good as new, and its superiority over others that are so likely to break by use, can readily be seen. It has also other advantages. Its speed is more regular, and consequently will break less grain than any other. It is also more convenient and runs with more ease, and is more pleasant to the feeder, as there is no dust blown from it to his face. These machines are known and in use in every State of the Union, and those "Old Foggies" who have been waiting for twenty years for one of these Drums to explode, will soon have to "give in" that their theory has exploded, and acknowledge our Drum to be the best in the world, as thousands who have used them in the last twenty years have testified.

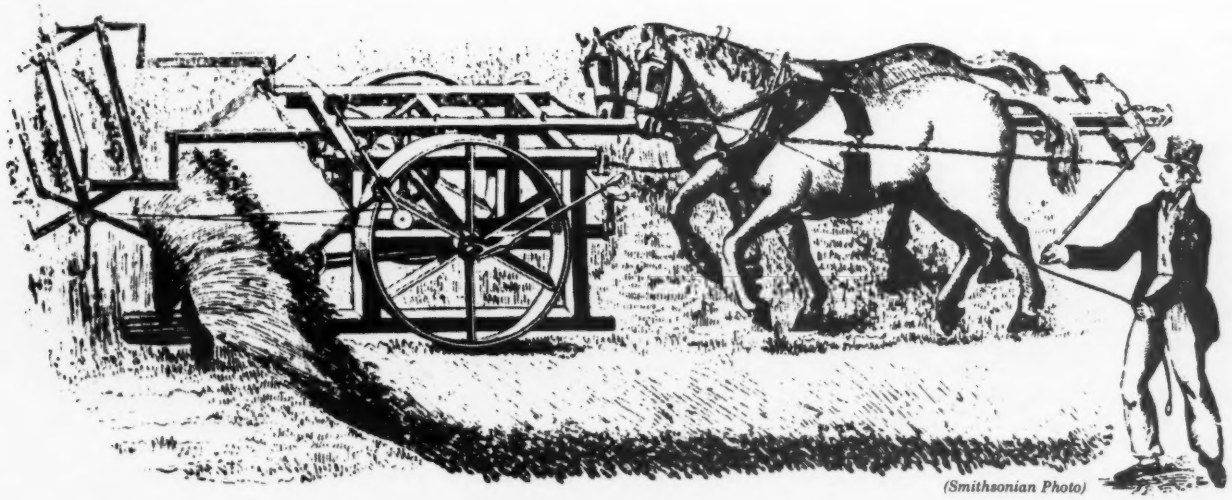
Prices—20 inch Drum, $50—24 inch Drum, $60—Straw Carrier to either, $15.

We have also the common THRESHER, as good as can be had in the market, at $35 to $40.

my1 E. WHITMAN & CO., 63 EXCHANGE PLACE, BALTIMORE.

(Smithsonian Photo)

Labor-saving machines soon evolved to provide relief and expand the harvest. The advertisement (above) appeared in The American Farm Advertiser, July 1859. The 1831 McCormick reaper (left) was the progenitor of that company's line. Less successful was Bell's reaper, an 1826 device putting the "cart before the horse."



(Smithsonian Photo)

Farm Labor's Niche in History

When early man dropped the first seed in the ground and produced food, a demand for agricultural labor was born.

The American Indians were among the first farmworkers. Nearly 3,000 years ago, Indians in the Southwest formed settlements to cultivate maize, squash, and beans.

On the Atlantic seaboard, the Indians cleared land to plant a variety of crops. Recognizing the value of fertilization, they buried fish along with the seeds.

When the Spanish settled the New World, they forced nearly 5 million Indians into virtual slavery under the "encomienda" system. The Spaniards, believing that the natives should be "converted, civilized, and exploited," distributed the Indians and their land among themselves and held them in trust. The trustee, or "encomiendaro," was charged by the Spanish King with converting and taking care of the Indian. In return, he was empowered to exploit Indian labor, sharing the profits with the King.

Convict labor. Convicts were another source of agricultural labor in the American colonies. As early as 1620, England was sending criminal elements to the colonies. The prisoners, most of whom arrived with 7-year terms, were used to harvest rice, tobacco, and indigo. Probably as many as 50,000 convicts were shipped to the colonies prior to the Revolutionary War.

One of the most common methods of transporting labor to colonial America was the indentured servant system. Under this practice, English citizens who wanted to come to America but lacked the necessary funds, would agree to temporary servitude, usually 3-7 years, in exchange for their transportation, room and board, and a small sum at the end of their period of service. This system provided the needed financing for the transportation of more than 60 percent of the colonial immigrants to America.

Cotton breeds slavery. The success of tobacco as a cash crop first whetted the colonists' appetite for Negro slave labor. The invention of the cotton gin in 1793 turned it into an insatiable demand. The slave population of the colonies grew from slightly over 20,000 in 1700 to nearly 4 million at the outbreak of the Civil War in 1861.

In 1869 the first transcontinental railroad was completed, and thousands of Chinese coolies who had been working on the railroad found their way into agriculture. This influx helped California farmers switch from wheat to more labor-intensive fruit and vegetable crops.

The Exclusion Act of 1882 prevented the use of Chinese labor, and California growers turned to

Japanese farmworkers to harvest their crops. Before long the Japanese constituted a major percentage of the agricultural labor force in selected crops. Anti-Japanese sentiment following World War I phased out the use of Japanese farmworkers, and California growers turned to Mexico as their last ready supply of cheap farm labor.

Mexican labor. The Immigration and Nationality Act of 1917 permitted Mexicans to enter the U.S. to work as agricultural laborers. Before this act, workers from Mexico had simply filtered across any part of the long, unguarded border between the two countries, performing simple harvest chores, and then returning the same way they had come.

When the Act expired in 1942, agricultural workers from Mexico, or "braceros," were admitted into the U.S. as temporary farmworkers under various governmental authorities.

In 1951, Congress passed Public Law 78, which served as the statutory basis for the contracting of braceros until its expiration in 1964. Unlike the previous bracero program run by USDA, this one was controlled by the U.S. Department of Labor. More than 4 million Mexican farmworkers were legally employed in the U.S. under this program. In its later years, the bracero program was severely criticized by those trying to organize agricultural labor.

Unionization. Although there had been attempts to unionize agricultural labor since the turn of the century, efforts prior to World War II were largely unsuccessful because of the ready supply of foreign labor—Chinese, Japanese, Korean, Mexican. Even without alternate labor sources, the unionization of farmworkers would have been difficult. For example, agricultural laborers are widely dispersed on different farms, and tend to move from one job to the next with the ripening of crops, thus making themselves a very diffused target for unionization.

In 1947 the American Federation of Labor chartered the National Agricultural Workers Union. One of the Union's first projects was to organize grape pickers in the Di Georgio vineyards in California. The attempt failed because of a Federal injunction against picketing and the importation of strikebreakers by the grower.

First success. Not until the California grape pickers strike by Cesar Chavez and the United Farm Workers (UFW) in 1965, were unions particularly successful in organizing agricultural workers. The UFW succeeded in part because of the high visibility of their campaign, which resulted in a nationwide boycott of grapes. Another bonus was the popularity of Cesar Chavez.

In April 1966 the first grower signed with the UFW, and by the following April over 30 growers had followed suit. Although significant, the unionization of grape pickers accounted for only 1 or 2 percent of the total agricultural labor force in California. Since the sixties, the UFW has faced opposition from growers, and has had to compete for members with the International Brotherhood of Teamsters.

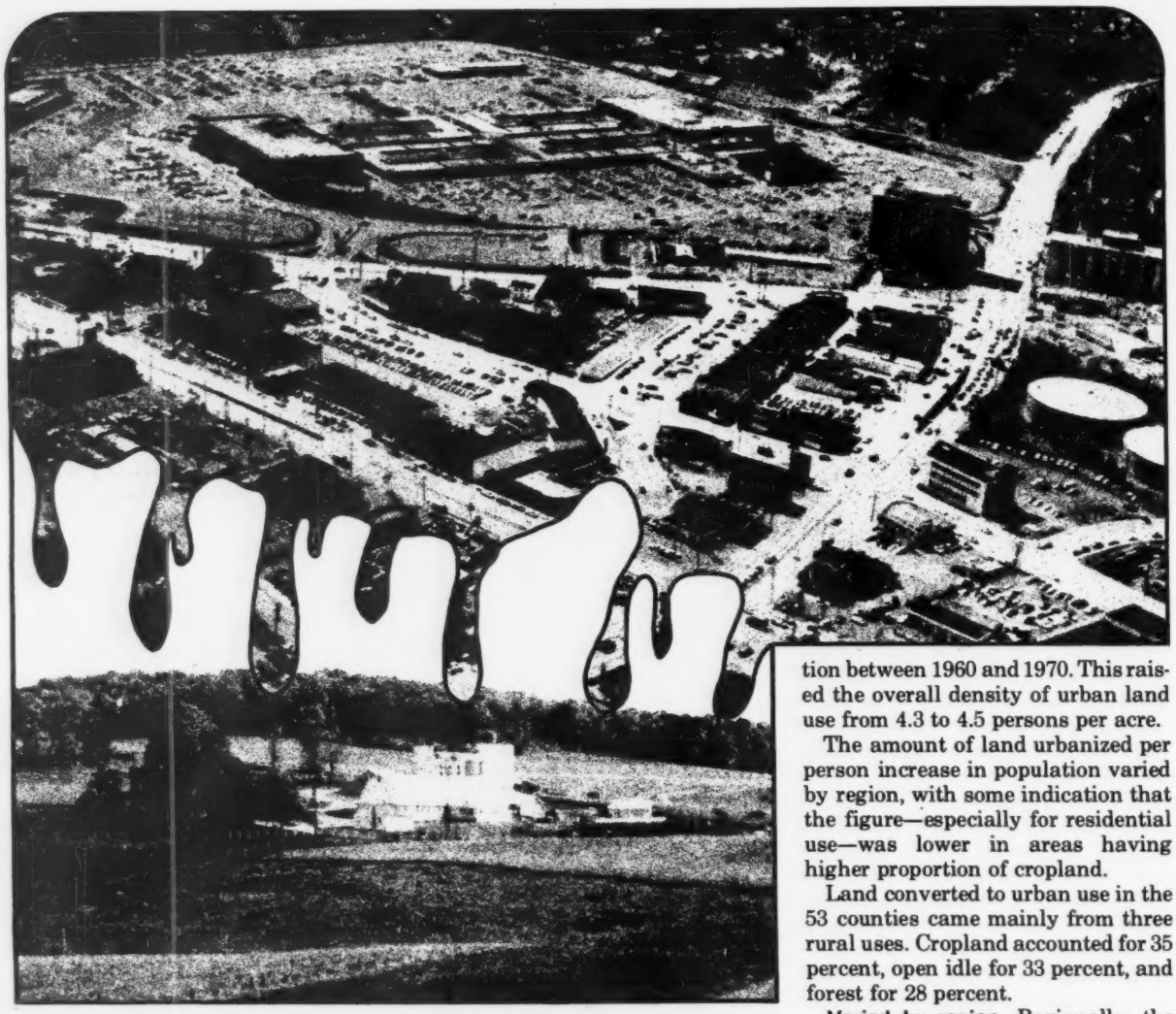
What lies ahead? The future of U.S. agricultural labor seems to point to less migratory and seasonal farmworkers and to more full-time employees. In the last 30 years the number of farms has declined over 50 percent, while farm size has almost doubled. Larger farms mean more opportunity for mechanization, and less need for seasonal labor.

Children of seasonal farmworkers often help with the harvesting.

Even so, the total number of hired farmworkers has been on the increase in recent years. About 2.7 million did farm wage work in 1972-74, some 20,000 more than in the previous 3 years. The 1975 figure was even higher—2.8 million.

[Based on the manuscript, "Agricultural Labor in the United States: A Brief History," by Tom Fulton, National Economic Analysis Division.]

Migratory workers have long been a source of U.S. agricultural labor.



Urban Encroachment
Not as Bad as it Looks

The human eye can't deny it: A ride down the highway tells you that housing developments, shopping malls, and other trappings of urban living are gnawing away at our cropland base.

Seen from an airplane, the picture is less alarming: Urbanization's toll on agricultural land has not been as heavy or extensive as many people have feared.

On examining aerial photos of 53 urban fringe counties in 1960 and 1970, ERS found that cropland, pasture, and forest remained the chief uses of the land. This despite the fact that land area claimed by urban uses increased from 13 percent to 16 percent in the 10-year period.

Drop in the bucket. For all 53 counties—and they absorbed one-fifth of total U.S. population growth in the 1960's—the amount of land converted to urban uses was only .173 acres (less than two-tenths of an acre) for each person added to the population between 1960 and 1970. This raised the overall density of urban land use from 4.3 to 4.5 persons per acre.

The amount of land urbanized per person increase in population varied by region, with some indication that the figure—especially for residential use—was lower in areas having higher proportion of cropland.

Land converted to urban use in the 53 counties came mainly from three rural uses. Cropland accounted for 35 percent, open idle for 33 percent, and forest for 28 percent.

Varied by region. Regionally, the proportion of urban development at the expense of the different rural uses varied greatly. Generally, the proportion of new urban development on different non-urban uses appeared to show some positive relation to the proportion of land originally in various rural uses.

However, where cropland was the most important previous use, the amount of land urbanized per person tended to be lower. Thus, in the two California counties where 70 percent of new urban development was on cropland, the land urbanized per person increase was .097 acres. In the three Florida counties, where only 6 percent of new urban development

was on cropland, .481 acres of land were urbanized per person increase.

Gone: ½ million acres. Overall in the 53 counties, cropland shrank by over one-half million acres. Losses were heavy in several areas with a high proportion of prime agricultural land.

The 11 Corn Belt counties, for example, lost 67,000 acres of cropland. Two California counties—Santa Clara and Santa Cruz—lost 40,000 acres. Six counties in the better agricultural areas of Minnesota, Wisconsin, and Michigan lost 92,000 acres.

On the other hand, almost 325 thousand acres of the cropland drain occurred in areas where cropland had been declining for reasons other than urbanization; e.g. in the Northeast, Appalachia, Eastern Piedmont, and the central Texas prairie area. Some of this was the direct result of urbanization, but much land would have shifted to pasture or forest in any case because it had become uneconomic to continue cropping it.

Idle shifts to urban. A lot of land was idled during the study period. But, at the same time, much idle land went to urban uses. Generally, the open idle land was in a state of transition between agricultural use and a new urban use. Some land was probably idled permanently, or at least for long periods, in the urbanization process.

However, the results of the study did not show much net increase in idle land where there were large acreages of prime agricultural land. An exception was in the Great Lakes counties—in Minnesota, Wisconsin, and Michigan—where a net 52,000 acres were idled, of which about 80 percent was cropland.

ERS researchers drew several conclusions from their study of the aerial photos—

Rural land loss. Land uses did not change dramatically in the 53 counties over the 9-year period. Total net decline in rural land (cropland, pasture and range, open idle, and forest) was 7 percent.

- Not all the cropland loss was directly attributable to increase in urban land. Only about a third of the land shifting from cropland went to urban uses.
- Even in urban areas shifts among rural uses were an important aspect of land use change. Some new cropland was developed even in areas with rapidly growing populations.
- Open idle land use had the most dynamic changes of any of the uses. Though some cropland and pasture were idled, half as much new cropland and pasture was developed from idle land as was abandoned to idle status.

Room for research. The results of this study bring up two additional questions on agricultural land use changes in urbanizing areas:

- How much agricultural land is idled because it is uneconomic to farm for reasons unrelated to urbanization, and how much would have real economic potential were it not for urban encroachment?
- Who owns the idle land—farmers or land speculators—and what are their plans and motivations that will affect future availability for agricultural use?

Future ERS research will address these questions.

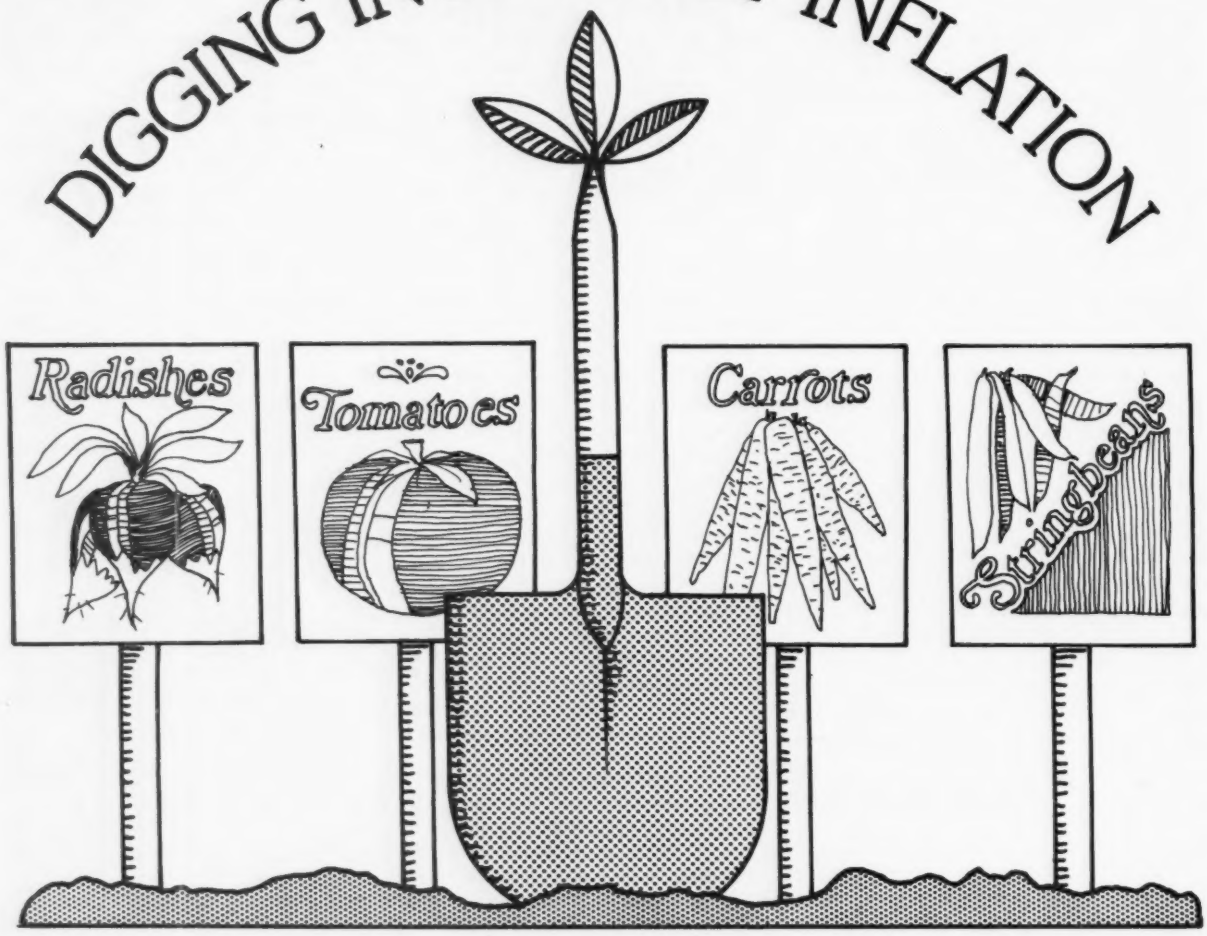
[Based on manuscript "Dynamics of Land Use in Fast Growth Areas," by Kathryn A. Zeimetz, Elizabeth Dillon, Ernest E. Hardy, and Robert C. Otte, Natural Resource Economics Division.]

THE 1961-70 SCOREBOARD: CHANGES IN URBAN LAND USE BY REGIONS FOR 53 COUNTIES

Item	NE[1]	Mid-Atlantic[2]	Piedmont[3]	Appalachian fringe[4]	Florida Gulf[5]	Jackson Co. Miss.[6]	Corn Belt[7]	Great Lakes[8]	So. Cen. Prairie[9]	Texas Prairie[10]	Colorado[11]	California[12]	53 county total
						1,000 acres							
Urban land[13]													
1961	450.5	195.8	234.8	152.0	72.4	20.4	525.2	228.1	345.7	406.7	80.3	90.2	2802.1
1970	550.2	255.6	338.9	185.8	136.4	34.2	605.3	281.9	432.5	500.2	115.0	125.9	3561.8
Net change 1961-1970	+99.7	+59.8	+104.1	+33.8	+64.0	+13.8	+80.1	+53.8	+86.8	+93.5	+34.7	+35.7	+759.7
Gross additions to urban land 1961-1970	99.9	60.0	104.9	34.2	64.0	13.8	80.8	56.1	86.8	94.6	39.0	35.7	769.7[15]
							Percent						
Converted from:[14]													
Cropland	25.5	39.3	19.2	34.1	6.2	9.7	49.2	62.0	14.8	48.8	55.8	70.1	34.6
Pasture and range	1.0	.5		2.2	10.0		.6	2.7	4.6	8.7	3.6	7.2	3.5
Farmsteads	.4	1.2					.3	.3		.9	1.8		.4
Open idle	23.3	32.4	23.3	47.1	61.1	24.2	37.3	20.2	40.7	30.1	37.5	19.2	32.8
Forest	49.8	26.6	57.2	15.9	16.2	66.1	12.4	14.8	39.9	11.3		3.5	28.0
Water bodies more than 40 acres					1.1		.3						.1
Miscellaneous			.3	.7	5.4					.2	1.2		.6

[1]Plymouth, Mass.; Burlington, N.J.; Monmouth, N.J.; Morris, N.J.; Sussex, N.J.; Bucks, Pa.; Chester, Pa. [2]Harford, Md.; Howard, Md.; Montgomery, Md.; Prince Georges, Md.; Henrico, Va. [3]Cumberland, N.C.; Mecklenberg, N.C.; Wake, N.C.; Cobb, Ga.; Dekalb, Ga. [4]Portage, Oh.; Monroe, Ind.; Fayette, Ky.; Madison, Ala. [5]Lee, Fla.; Pasco, Fla.; Sarasota, Fla. [6]Jackson, Miss. [7]Dupage, Ill.; Lake, Ill.; Will, Ill.; Porter, Ind.; Boone, Mo.; Clay, Mo.; Jefferson, Mo.; St. Charles, Mo.; St. Louis, Mo.; Sarpy, Neb.; Johnson, Kan. [8]Macomb, Mich.; Washtenaw, Mich.; Waukesha, Wis.; Anoka, Minn.; Dakota, Minn.; Washington, Minn. [9]Cleveland, Okla.; Harris, Tex.; Travis, Tex. [10]Collin, Tex.; Dallas, Tex.; Denton, Tex.; Tarrant, Tex. [11]Adams, Col.; Arapahoe, Col. [12]Santa Clara, Calif.; Santa Cruz, Calif. [13]Includes residential, urban idle, transportation, recreation, and commercial-industrial-institutional uses. [14]Percents may not total 100. [15]Includes 10,000 acres which changed to open idle.

DIGGING IN AGAINST INFLATION



As the ugly head of inflation rises up to bite family food budgets in supermarkets, many Americans are retreating to the homefront and digging into their backyards.

With a few dollars of garden tools, fertilizer, and seeds, they hope to raise and preserve enough vegetables to ease food costs.

Yet, as blisters, callouses and backaches grow, the question may logically rise: Is all of this really worth it? A USDA report that examined economics of home gardening, canning, and freezing answers with a resounding "maybe." Here are a few key findings:

- Home gardens may produce a tidy savings, if the gardener doesn't charge for his time and labor.
- Freezing in a home freezer is the most convenient form of preservation, but dollar savings are severely reduced by fuel and investment costs. For freezing costs, add 12 to 24 cents per pound of food. If the item is still cheaper than store prices, freeze it if you like.
- Canning is easily the most economical method of preservation, especially with amortization of lid and jar costs. Yet, work and know-how are required.

Obviously, much more is involved in home food production than buying a few seeds and reaping a harvest. The gardener must make several critical decisions based on costs, inconvenience, and returns.

Bountiful harvest. Also, the ERS forecast of food prices may lessen the economic incentive for gardening. America is enjoying its most bountiful harvest ever, with record corn, wheat, rice, and soybean crops, and plentiful supplies of many fruits and vegetables. The result: Retail food prices in first half 1976 are expected to rise 4-5 percent at an annual rate. This compares with 8½ percent for all of 1975.

Nevertheless, savings can be substantial for the thoughtful and persistent gardener.

In examining the economics of gardening and preserving foods, the best place to start is at ground level: the economics of home gardening. Several studies have examined the costs and returns of home gardening, including one by Cornell University researchers.

Costs per bushel. The 1975 Cornell study found that a bushel of green peas purchased from a roadside stand cost $6 a bushel. At a pick-your-own farm, the price dropped to $3 a bushel. And a bushel grown in a home garden cost only $1.17 plus a share of the fixed costs for the total gardening operation.

This encouraging finding echoes a 1973 student project at the University of Maine—a theoretical comparison of costs versus supermarket value of a 1,409-pound vegetable yield in a 4,800-square foot plot. At supermarkets, the crop would have cost $521. Total costs in growing the crop amounted to only $92, leaving a tidy $430 profit. If the gardener's time is worth something, subtract another $189 for labor costs, and the result is still a substantial profit of $240.

A tidy "profit." In another study, a Wisconsin extension agent gained a $152 "profit" from his 30 x 30-foot plot on public lands after subtracting $27 for expenses.

Other studies tend to bear out the bright picture of substantial returns for the small gardening investment, especially when labor costs aren't considered. Yet, this encouragement must be tempered with a few words of warning:

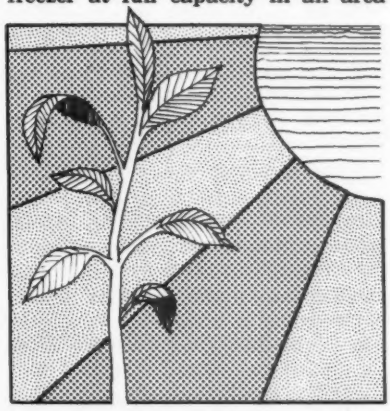
- Home gardening, like farming, offers no assurance of a bumper harvest, despite the gardener's skill and work. Crop failures can wipe out the investment.
- Gardening requires a continuous commitment of time and labor over the entire growing season. Seeds and plants require tender loving care.
- If the gardener succeeds in growing a bountiful crop, he may face a second difficult problem: what to do with all those vegetables?

Making a choice. The answer may lie in choosing between freezing and canning the excess.

Many people may choose the convenience of freezing, especially after considering the mess and work of canning. Yet, they should be aware of the economic drawbacks of this convenience.

Freezing entails much more than simply going out and buying a freezer, plugging it in, and filling it with food.

Another Cornell University study found that home frozen food costs as much as 19 cents a pound more than if you bought it at the supermarket—even when using an energy-efficient freezer at full capacity in an area



where electricity rates are relatively low. High electric rates, poorly operating freezers, or inefficient use can drive costs up as high as 53 cents a pound.

Fixed costs. In addition, fixed costs for a freezer are steep in the short run. In calculating the costs, finance charges, taxes, delivery, and installation should be divided by the 20-year life expectancy. USDA also estimates a 2-percent annual repair cost.

Using these criteria, total overhead for a $300 15-cubic foot freezer is about $17 annually. With repairs, interest, and electricity, annual operating costs would range from $80 to $247, depending on cost of electricity.

If the gardener is still determined to freeze, then he should carefully select the freezer. Convenience of a frost-free freezer adds about $24 a year to electricity costs.

Turnover rate. Size of freezer is another factor. Cost per pound of food ranges from 7 to 13 cents for a 12-cubic foot freezer, and 5 to 9 cents for an 18-cubic foot freezer, depending on the turnover rate. The greater the turnover, the lower the cost per pound.

Food must also be packaged before being frozen. Packaging costs vary greatly, depending on the container and whether it can be reused. A plastic bag with twist tie adds only 1.2 to 2 cents a pound, while a plastic freezer wrap can add 10 cents a pound. Reusable containers cost 19 to 38 cents per pound initially.

In preparing food for freezing, water costs a half cent per pound.

Savings increased. All told, cost per pound of food for a 15-cubic foot freezer is 22.4 cents, or about the same as retail prices for the least expensive frozen fruits and vegetables. However, costs do not increase appreciably with turnovers, thus the savings of freezing may rise considerably with, say, a 6-month turnover.

Although savings may result if homegrown vegetables are frozen, such savings may be questionable when store-bought food is stored.

Cornell researchers report that storage costs may add up to 20 cents a pound to the food price during a year's time. Thus, that pound of vegetables bought at a 10-cent discount may turn into a 10-cent loss over a year.

If the gardener is discouraged from freezing, he may turn to canning. Canning is probably the most economic and practical way of preserving food at home.

Canning costs vary. Costs of canning vary with the nature of the product, equipment, and the means of acquiring the product to be canned. In most instances, however, savings may be significant.

In determining total canning costs, the home gardener must consider costs of produce, equipment, energy, and water.

Cost of produce varies. If bought at a store, it may be a major expense, while homegrown or roadside stand vegetables are, of course, much cheaper.

In equipment, the most expensive item is the pressure canner, costing from $40 to $70 for common models. Smaller models cost $20 to $35. This

cost may be amortized over the 15-20 year life expectancy, with a 2-percent annual repair cost.

Assorted equipment. Other equipment may include a large water bath canner for fruits, tomatoes, pickles, and preserves, which cost about $6; a jar lifter for $2 to $3; and a funnel and canning book.

New canning jar units cost $2.29 to $3.49 a dozen. The jar unit costs can be amortized over a 10-year period. Lids cost 1½ to 5 cents, and rings are 1 cent, amortized over 10 years.

Energy costs vary with heating requirements and local fuel costs.

Water, for washing produce, and steam, for blanching, costs about a half cent per pound of food canned.

One study combined these costs and found that the estimated cost for canning 280 quarts was $25.40, or 9 cents per quart, not including the cost of food and labor.

Peaches and beans. A Cornell University study examined costs of canning peaches, tomatoes, and green beans.

A quart of homegrown peaches, canned with jars already on hand with new purchased lids, cost 20.5 cents. If produce is purchased, the total cost increased to 66.8 cents. If jars are purchased at 28.3 cents each, the cost is 44 cents or 90.5 cents, depending on whether the peaches are bought or homegrown.

Cost of a quart of tomatoes ranged from 4.3 cents to 50.9 cents.

A quart of green beans cost from 4 cents to 63 cents.

The study also examined energy costs for canning, and found that at 2.8 cents per kilowatt hour, the energy component in a quart of peaches and a quart of tomatoes was about 1 cent each, while the cost for a quart of green beans was about a half cent.

Canning vs. retail cost. How do canning costs compare with retail prices at stores? Cornell University researchers compared their findings in peaches, tomatoes, and green beans to store prices in Ithaca, N.Y., in April 1975. They found that:

Canned peaches ranged from 20.5 to 90.5 cents per quart, while store prices ranged from 94 cents to $1.10.

Tomatoes could be canned for 4.3 to 50.9 cents per quart, while retail stores sold them for 64 to 90 cents.

Green beans could be canned for 4 to 63 cents a quart, compared with store prices of 62 to 78 cents.

While these figures may indeed be enticing, the home canner should be forwarned about other considerations before happily embarking on a canning spree:

- Adequate storage space is needed where jars are protected.
- Misguided creativity in canning can lead to waste, or even family sickness due to spoilage.
- Some foods are available year round at reasonable costs.
- Commercially frozen orange juice is a far better source of vitamin C than home canned tomatoes or juices.
- It is economical to can and freeze only the amount that can be used within a reasonable period of time.

An extensive study by Michigan State University researchers points to still another major consideration: Gardening and canning must be continued over several years to produce a real savings. The reason: The initial capital investment of gardening and canning equipment must be amortized.

Capital costs. The study shows that gardening and canning costs, without allowance for capital investment in items ranging from pressure cookers to wheelbarrows, total only 37 cents a quart for green beans, assuming 180 quarts of all commodities are canned per season. Yet, capital investments can turn this initial savings into a big loss during the first year.

During the first year, without amortization, gardening costs are 33 cents per quart, and canning costs are 51 cents per quart. Amortized over 20 years, gardening capital costs are only 2 cents, while canning capital costs are 3 cents per quart.

Persistency pays. Thus, the faint-hearted home food producer should beware: That quart of green beans could cost $1.54 if he gives up the project after 1 year. Yet, the persistent home gardener who continues the operation over 20 years may "pay" only 43 cents per quart after capital costs are amortized.

The Michigan State researchers added still another warning: Labor costs for canning and gardening aren't considered in the study, so the home producer may still ask—Is it worth it?

There's a way to determine the answer. Here's what the researchers advise.

Carefully keep track of the hours spent in gardening and canning, and campare store prices with home production costs after a year. Then, subtract the costs from the savings and divide the savings by the number of manhours. The result will be the per hour "pay" for labor.

No economic windfall. Regardless of whether freezing or canning is used to store garden produce, it's unlikely the home producer can realistically declare that the efforts produced an economic windfall. Yet, if he views it as a hobby, the successful gardener can enjoy the tasty "fruits" of his labor and still relish some savings.

[Based on the speech, "Canning and Freezing: What is the Payoff?" presented by Evelyn H. Johnson, USDA Extension Service, at the 1976 National Agricultural Outlook Conference in Washington on November 20, 1975, and the ERS Winter Food Preview.]

Clothing Expenditures Double in a Decade

American consumers have more than doubled their spending for clothing in the past decade, according to an ERS study.

Clothing expenditures increased by 111 percent from 1964 to 1973, as the percentage of personal disposable income going for clothing edged up from 6.5 to 6.6 percent.

The study also found a significant shift in consumption and production of fibers. Cotton, wool, rayon, and acetate fibers lost ground to noncellulosic fibers, such as polyesters.

Back in 1974, consumers put out less than $19 billion for women's and children's clothing and $10 billion for men and boys' clothing. By 1973, spending had jumped to almost $39 billion for women's and children's clothing, and $21 billion for men's and boys' clothing.

Comparing U.S. fiber consumption between 1964 and 1974, the study found that noncellulosic use rose from 8.1 pounds per capita in 1964 to 31 pounds in 1974; cotton dropped from 22 to 16 pounds, wool from 2.6 to .7 pounds, and rayon and acetate from 8 to 5 pounds.

Production trends were similar, as cotton production fell from 7 billion pounds to 5½ billion pounds, wool production from 119 to 67 million pounds, and rayon and acetate from 1.4 to 1.1 billion pounds. Manmade noncellulosic production, meanwhile, leaped from 1.4 to 6 billion pounds.

In percentage of the total fiber market, cotton and wool had 70 percent in 1964, but only 41 percent in 1974.

Department stores remained the most popular clothing outlet. In 1963, close to 40 percent of women's and girls' clothing was sold there, along with a third of men's and boys' clothing. In 1973, department stores covered over 44 percent of the market for women's and girls' clothing, and about 39 percent for men's and boys' clothing.

[Based on the paper, "An Overview of the Marketing System for Textile Fibers and Products," by R.S. Corken, National Economic Analysis Division, presented in New Orleans, La., on September 24, 1975.]

Wastewater Irrigation: Will It Work?

Treatment of wastewater from municipalities by application to land is drawing increased attention, according to an ERS study. The establishment of such systems requires the acquisition and management of land for treatment purposes.

In Germany, a wastewater cooperative has been successfully used to manage such a land treatment system. So, ERS researchers decided to test the applicability of such a cooperative to U.S. use by developing a strictly hypothetical model for testing.

The researcher based his study on the concept of a wastewater cooperative applied in the Detroit Metropolitan area. A 72,000-acre site near Detroit was the locale of the theoretical cooperative.

Using the model, a comparison of production estimates with and without wastewater irrigation showed that corn production would have increased 36 to 70 percent with wastewater irrigation, with lesser increases for soybeans, drybeans, wheat, and alfalfa hay.

If costs and benefits of the system were divided between the city and farmers under a prearranged agreement, the city would likely pay the bulk of the costs.

Preliminary results indicated that with conservative yield and price effects, about 75 percent of the $9.3 million annual total costs of the system would have had to be paid by the municipality if farmers were to have realized an economic gain and, thus, found incentive to join such a cooperative.

[Based on the manuscript: "Land Treatment of Municipal Wastewater: A Cooperative Approach to Management," by Lee A. Christensen, Natural Resource Economics Division.]

Recent Publications

1976 U.S. Agricultural Outlook. Economic Research Service. Congressional Committee Print.

In 434 pages, this committee print compiles all the papers given at the National Agricultural Outlook Conference held by USDA in November. Many of the papers include the graphs used in the original presentations. The print was prepared for the Committee on Agriculture and Forestry, U.S. Senate.

Supplement for 1973 and 1974 to Wool Statistics and Related Data, 1930-79. Shirley M. Frye, Commodity Economics Division. Sup. to Statis. Bul. 455.

This annual supplement brings up to date the long-time statistical series presented in *Wool Statistics and Related Data, 1930-69,* published in June 1970. Coverage includes primarily production, consumption, international trade, and prices of wool, mohair, and similar hair fibers of the U.S. Selected data on cotton and manmade fibers are given along with certain data on wool for several other countries and world totals.

Farm Population Estimates for 1974. Vera J. Banks, Economic Development Division. AER-319.

Farm population continued its long-term downtrend during 1970-74, but at a slower pace than in the 1960's, according to this study. The average annual decline was only 1.2 percent, compared with the sixties' rate of 4.8 percent. The South continued to be the heaviest loser of farm population among the regions.

Taxes Levied on Farm Personal Property, 1960-72. Ann Gordon Sibold, Economic Development Division. AER-321.

Farm personal property taxes in the U.S. went up over 48 percent during 1960-72, this study concludes. Arkansas had the highest 12-year rate of increase at over 153 percent, followed by California at 150 percent. However, the study notes a trend in which more and more States are exempting all or part of farm personal property from taxation.

Single copies of the publications listed here are available free from The Farm Index, Economic Research Service, Rm. 1664-So., U.S. Department of Agriculture, Washington, D.C. 20250. However, publications indicated by (*) may be obtained only by writing to the experiment station or university. For addresses, see July and December issues of The Farm Index.

Costs of Producing Selected Crops in the United States, 1974: A Summary. Economic Research Service. ERS-620.

The result of a directive of The Agriculture and Consumer Protection Act of 1973, this study summarizes the results of a survey taken by ERS and the Statistical Reporting Service. Cost data are given for major crops—cotton, corn, grain sorghum, barley, winter wheat, durum wheat, other spring wheat, soybeans, peanuts, flaxseed, and milk—on both a national and regional basis. Data was collected from 40 production subregions chosen to represent the major U.S. crop production regions. Cost factors are broken down into major inputs, such as overhead, management, labor, etc.

Predicting Employment in Four Regions of the Western United States. Lloyd D. Bender, Economic Development Division. Tech. Bul. 1529.

This study tests a model designed to predict the local service employment associated with employment in basic industries within local communities of four regions of the western U.S. The model is based on the hypothesis that the ratio of the jobs in each sector are a function of an industry, its size, and distance from a major trade center.

Decentralized Tomato Processing: Plant Design, Costs, and Economic Feasibility. E. V. Jessee, W. G. Schultz, and J. L. Bomben. AER-313.

According to the study, decentralized tomato processing merits consideration as an alternative to the conventional centralized operation. If the tomato cleaning and juicing steps were done at satellite locations in the areas where tomatoes are grown and the final processing done at existing canneries, significant savings would result says the study.

The American Farmer

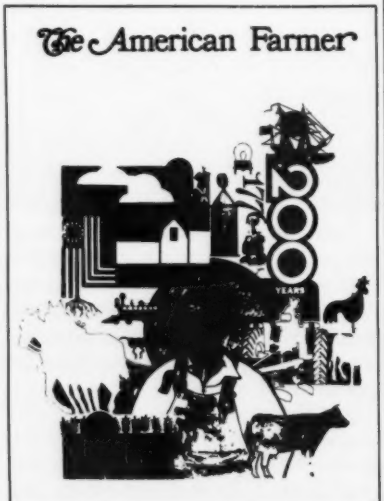
"This booklet sketches in bare outline one of the great stories of all time . . . the drama of American agricultural history, and something of the complexity of the forces that have shaped it . . ."—Foreword to *The American Farmer.*

Due off press in the next several months, *The American Farmer* is a collection of the 11 Bicentennial articles carried in The Farm Index since January 1975.

In more than 100 pages, including photos, charts, and other illustrations—many in two colors—you'll read of the developments that laid the foundations for the world's most productive agricultural plant.

A sampling of the articles: "The American Farmer—The First 200 Years"; "This Land of Ours"; "The Farmer and His Farm"; "Research and Development for Farms"; "The Farm Family: New Viewpoints"; "From Farm to Consumer"; "Farming for World Markets"; "The Farmer and the Environment"; and "Farming in the Third Century."

To reserve a single copy, write The Farm Index at the address given above. Free distribution will be limited to orders placed by March 15, 1976.



Economic Trends

Item	Unit or Base Period	1967	1974 Year	1974 Dec.	1975 Oct.	1975 Nov.	1975 Dec.
Prices:							
Prices received by farmers	1967=100	-	184	178	193	185	187
Crops	1967=100	-	214	214	199	188	188
Livestock and products	1967=100	-	164	153	190	184	187
Prices paid, interest, taxes and wage rates	1967=100	-	169	179	188	188	189
Family living items	1967=100	-	161	173	180	182	182
Production items	1967=100	-	172	184	192	192	192
Ratio[1]	1967=100	-	109	99	103	98	99
Wholesale prices, all commodities	1967=100	-	160.1	171.5	178.9	178.2	-
Industrial commodities	1967=100	-	153.8	166.1	174.7	175.4	-
Farm products	1967=100	-	187.7	183.7	197.3	191.7	-
Processed foods and feeds	1967=100	-	170.9	188.2	186.2	182.6	-
Consumer price index, all items	1967=100	-	147.7	155.4	164.6	165.6	-
Food	1967=100	-	161.7	169.7	179.0	179.8	-
Farm Food Market Basket:[2]							
Retail cost	1967=100	-	161.9	167.8	177.2	177.8	-
Farm value	1967=100	-	177.6	178.2	197.1	188.0	-
Farm-retail spread	1967=100	-	152.0	161.2	164.6	171.4	-
Farmers' share of retail cost	Percent	-	43	41	43	41	-
Farm Income:[3]							
Volume of farm marketings	1967=100	-	111	116	173	158	-
Cash receipts from farm marketings	Mil. dollars	42,817	93,521	7,975	11,563	10,500	-
Crops	Mil. dollars	18,434	52,097	4,850	6,894	6,500	-
Livestock and products	Mil. dollars	24,383	41,424	3,125	4,669	4,000	-
Realized gross income[4]	Bil. dollars	49.9	101.1	101.9	-	-	102.4
Farm production expenses[4]	Bil. dollars	38.3	73.4	74.0	-	-	78.0
Realized net income[4]	Bil. dollars	11.6	27.7	27.9	-	-	24.4
Agricultural Trade:							
Agricultural exports	Mil. dollars	-	21,994	2,120	2,082	2,176	-
Agricultural imports	Mil. dollars	-	10,247	966	829	805	-
Land Values:							
Average value per acre	Dollars	[6]168	[7]339	-	-	-	[8]354
Total value of farm real estate	Bil. dollars	[6]181.9	[7]335	-	-	-	[8]370
Gross National Product:[4]	Bil. dollars	793.9	1,397.4	1,430.9	-	-	-
Consumption	Bil. dollars	492.1	876.7	895.8	-	-	-
Investment	Bil. dollars	116.6	209.4	209.4	-	-	-
Government expenditures	Bil. dollars	180.1	309.2	323.8	-	-	-
Net exports	Bil. dollars	5.2	2.1	1.9	-	-	-
Income and Spending:[5]							
Personal income, annual rate	Bil. dollars	629.3	1,150.5	1,191.0	1,279.2	1,290.1	-
Total retail sales, monthly rate	Mil. dollars	26,151	44,815	45,109	49,955	50,705	-
Retail sales of food group, monthly rate	Mil. dollars	5,759	9,980	10,330	11,324	11,322	-
Employment and Wages:[5]							
Total civilian employment	Millions	74.4	[9]85.9	[9]85.2	85.4	85.3	-
Agricultural	Millions	3.8	[9]3.5	[9]3.3	3.4	3.3	-
Rate of unemployment	Percent	3.8	5.6	7.2	8.6	8.3	-
Workweek in manufacturing	Hours	40.6	40.0	39.4	39.9	39.8	-
Hourly earnings in manufacturing, unadjusted	Dollars	2.83	4.41	4.66	4.90	4.93	-
Industrial Production:[5]	1967=100	-	125	117	117	117	-
Manufacturers' Shipments and Inventories:[5]							
Total shipments, monthly rate	Mil. dollars	46,449	81,723	79,737	87,704	-	-
Total inventories, book value end of month	Mil. dollars	84,655	150,404	150,404	146,510	-	-
Total new orders, monthly rate	Mil. dollars	46,763	83,297	76,704	86,422	-	-

[1]Ratio of index of prices received by farmers to index of prices paid, interest, taxes, and farm wage rates. [2]Average annual quantities of farm food products purchased by urban wage earner and clerical worker households (including those of single workers living alone) in 1959-61—estimated monthly. [3]Annual and quarterly data are on 50-State basis. [4]Annual rates seasonally adjusted fourth quarter. [5]Seasonally adjusted. [6]As of March 1, 1967. [7] As of November 1, 1974. [8] As of March 1, 1975. [9]Beginning January 1972 data not strictly comparable with prior data because of adjustment to 1970 Census data.

Sources: U.S. Dept. of Agriculture (Farm Income Situation, Marketing and Transportation Situation, Agricultural Prices, Foreign Agricultural Trade and Farm Real Estate Market Developments); U.S. Dept. of Commerce (Current Industrial Reports, Business News Reports, Monthly Retail Trade Report and Survey of Current Business); and U.S. Dept. of Labor (The Labor Force and Wholesale and Consumer Price Index).

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